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# Detector for a Measuring Device

Description:

The invention relates to a detector for a device used to measure radioactive areas, said device having two electrodes between which a voltage is applied, and having also a counter gas between the electrodes.

The measuring of radioactive areas is carried out in particular to determine radioactive thin-film plates, paper chromatograms, electrophoretograms, thin sections of small organisms, DNA plotting strips or contamination. For this purpose, a Geiger-Müller counter or a proportional counter tube is used. These measuring devices are moved slowly over the surface to be measured and the radioactivity measured is recorded, for example, by a rate meter, counter and plotter.

When an area is measured by means of a proportional counter tube, the latter is incrementally advanced along the pathway to be scanned. Another possibility is to use several individual counter tubes arranged one behind the other.

It is further known in the art that radioactive areas on surfaces can be determined with the aid of a wire mesh detector (multiwire detector). In the radioactive zones, the counter gas between the suspended wire meshes, which are insulated from each other, becomes ionized and the location of the radioactive areas in the wire mesh can be displayed on a screen using known electronic methods of measuring radioactivity. The local distribution of the radioactivity in a sample can also be recorded photographically.

It is also known in the art that the distribution of radiation on surfaces can be measured by applying a layer of photographic emulsion which is blackened by the radiation (autoradiography). However, the disadvantage of this method is that, depending on the amount of activity, long exposure times of up to several months have to be tolerated. In the recent past, autoradiography has been further developed. In order to avoid long exposure times, a layer of phosphorus, for example, is used; electrons in this layer of phosphorus become excited and can be converted into an optical image by scanning them with a laser beam.

The disadvantage of this method, however, is that quantitative determination of the local distribution of the radioactivity is unsatisfactory.

When a multiwire detector is used, the spatial resolution of closely adjacent areas of radioactivity is poor, because obliquely incident radiation also triggers ionization of the gas. An attempt is made to eliminate this deficiency by using a multi-hole collimator between the radioactive surface and the detector. However, this has the disadvantage that the sensitivity of the measuring device is considerably reduced. In addition, it has been discovered that the lack of rigidity and stability of wire meshes used as electrodes can give rise to problems as regards the reproducibility of the measurements.

The purpose of the present invention is to develop the detector to such an extent that the local resolution is further improved. In addition, the purpose is to improve the reproducibility of the measurements.

This goal is accomplished by means of a detector for measuring radioactive areas, said detector having the features described in

Claim 1. Advantageous refinements of the invention are described in the sub-claims.

The detector according to the invention is characterized by the fact that the electrodes are arranged on opposite surfaces of a support. In addition, channels are provided which pierce the electrodes and the support, so that the counter gas is in contact with the electrodes via these channels.

The counter gas fills the individual channels. Thus, each channel acts as both a collimator and a counter tube in which the gas is ionized once radioactivity penetrates the channel, and finally photoexcitation is triggered as a result of the avalanche effect; this can be easily and rapidly detected, for example, by known photographic methods. Via the totality of the channels in the detector according to the invention, an image is obtained of the distribution of the radioactivity over the surface to be measured. In addition, almost 100% detectability of the particles or quanta travelling vertically in relation to the measurement plane is obtained, and deterioration of the local resolution caused by particles or quanta travelling along obliquely oriented paths is prevented.

The detector as such is rigid and robust, thus guaranteeing reproducibility of the measurements.

In accordance with an advantageous further refinement, the electrodes are arranged directly on the support. The latter consists of an electrically non-conductive material. The support may consist wholly or partially of a ceramic material. Other materials, such as Teflon or epoxide, are possible.

The support may also be made of an electrically conducting material. In this case, it is proposed that a layer of insulation be provided between the electrodes and the support. The use of an electrically conductive material may be of interest if this simplifies the formation of the channels.

In accordance with a further refinement of the concept according to the invention, it is proposed that first and second electrical conductors be arranged over the channels. The first conductors extend in a first direction and the second conductors extend in a second direction. The first and second conductors form a grid-like mesh.The individual conductors are electrically insulated from each other. The individual conductors running in both directions in the same plane, which is parallel to the plane of the electrode, act as triggering electrodes for the ionization processes in the individual channels. If an ionization process is triggered in a channel, a voltage is induced at the point of intersection of the two sets of conductors; this voltage can be evaluated in an evaluation unit and can be displayed, for example, on a screen. By means of this refinement, it is possible to dispense with evaluation by photographic means. As a result, the measuring time can be reduced. It is advantageous to keep the diameter of the channels between 0.2 and 0.05 mm.

The spacing between adjacent channels is advantageously kept at 0.1 to 1 mm.

The spacing between the electrodes should preferentially be between 3 to 10 mm. However, this spacing can be adapted to the energy of the particles or quanta to be measured.

Instead of adapting the spacing between the electrodes, it is proposed that the pressure of the counter gas be varied according

to the energy of the particles or quanta to be measured. This has the advantage that, by varying the pressure, it is possible, using a detector, to measure different particles or quanta.

Advantageously, the detector is arranged in a housing, at least one wall of which is transparent to the type of radiation to be measured.

It has been discovered that the counter gas consists advantageously of a mixture of neon, helium and methane. Methane is used here as a quenching gas.

Further advantages and characteristics of the subject of the invention are explained with reference to an embodiment of the invention, as follows:

Figure 1 is a perspective view of a detector,

Figure 2 is a second view of a detector

Figure 3 is a detector mounted in a housing.

The detector 7 comprises two electrodes 1, 2 between which a voltage V is applied. The electrodes 1, 2 are arranged on opposite surfaces 4, 5 of a support 3. Channels pierce the electrodes 1, 2 and the support 3. The counter gas Z is in contact with the electrodes 1, 2 via the channels 6.

The detector 7 possesses a plurality of channels 6. The channels are formed in the two directions X and Y and are equidistantly spaced from each other. Each channel acts as a collimator and a counter tube.

First and second electrical conductors 8, 9, are arranged over the channels 6. The first conductors 8 extend in a first direction, namely the X-direction in the view presented here. The second conductors 9 extend in a second direction (Y-direction). The individual conductors 8 and 9 are electrically insulated from each other.

The points of intersection 8, 9 are positioned over the channels 6. Each individual conductor 8, 9 is connected with an evaluation unit, which is not shown here. The conductors 8 or 9 may be installed in an electrically non-conducting layer. These layers may be applied directly to an electrode. The layers may also be arranged at a distance from the electrode, as still remains to be described.

An ohmic resistore can be provided at each conductor. A constant voltage is applied to each conductor. If ionization occurs in a channel 6, a voltage is induced in the conductors 8, 9 assigned to the channel 6. From the change in voltage in the individual conductors 8, 9, it is possible to determine the location of the event.

The detector may be arranged in a housing 10. The housing 10 possesses a gas inlet 11 and a gas outlet 12. The wall 13 arranged opposite the electrode 1 is provided with an opening 14 corresponding to the electrode 1. By means of a device not shown here, it is possible to position a layer of photographic emulsion over the opening 14.

If a detector is used in a housing, as shown in Fig. 3, the inner chamber formed by the housing and a closure, not shown here, of the opening 14 must be flushed out using a flushing gas. Once the inner chamber has been flushed out, a counter gas is introduced

into the inner chamber. The gas pressure in the inner chamber is measured and held constant by a regulating means, which is not shown here, in order to achieve uniform sensitivity.

Instead of the opening 14, the wall 13 may consist of a material which is transparent to the type of radiation being measured. The housing of the detector may then be hermetically sealed so that no gas losses occur.